Amendments to the Drawings

Fig. 4A has been amended so that the box labeled 431 is outlined with a dotted line, as was suggested by the Office Action.

Attachment: Replacement Sheet

Annotated Marked-Up Drawings

REMARKS

In response to the Office Action mailed March 20, 2008, Applicants respectfully request reconsideration. Claims 1-3, 5-19, 21-40, and 42-47 are currently pending in this application. Claims 39 and 42 are being amended in the Claim Listing above. The application is believed to be in condition for allowance.

Objections to the Drawings

The Office Action objects to Fig. 4A for including new subject matter by way of the amendment filed by Applicants on November 30, 2007. Applicants have amended Fig. 4A in the manner suggested by the Office Action. Specifically, the element referenced as 431 is now shown with dotted lines. Accordingly, withdrawal of this objection is respectfully requested.

Objections to the Specification

The Office Action objects to the specification for including new subject matter by way of the amendment filed by Applicants on November 30, 2007. Although Applicants respectfully disagree, Applicants have amended the specification in the manner suggested by the Office Action in order to expedite prosecution. Specifically, the amendment of November 30, 2007, has been withdrawn, and the reference number 431 has been included on page 22, lines 12-15 of the written description. Accordingly, withdrawal of this objection is respectfully requested.

Objections to the Claims

The Office Action objects to Claim 42 for dependence informalities. Claim 42 has been amended and now depends on independent Claim 39. Accordingly, withdrawal of this objection is respectfully requested.

Rejections Under 35 U.S.C. §103

The Office Action rejects Claims 1-3, 5-19, 21, 22, 24-40, and 42-47 under 35 U.S.C. §103(a) as being unpatentable over Wong *et al.*, U.S. Patent No. 5,062,703 (hereafter "Wong"), in view of Verhoof *et al.*, European Patent Application No. 0 560 426 A1 (hereafter "Verhoof"),

Tomofuji *et al.*, U.S. Patent No. 5,383,046 (hereafter "Tomofuji"), So *et al.*, "Measuring Chromatic Dispersion and Modal Interference with an Optical Time-Domain Reflectometer" (hereafter "So"), and Akiyama *et al.*, U.S. Patent No. 5,982,530 (hereafter "Akiyama"). The Office Action also rejects Claim 23 under 35 U.S.C. §103(a) as being unpatentable over Wong in view of Verhoof, Tomofuji, So, Akiyama, and further in view of Lemus *et al.*, U.S. Patent No. 6,111,676 (hereafter "Lemus"). Applicants respectfully disagree.

Remarks Regarding the Claims:

Claim 1 recites "*...sweeping the pilot tone across a frequency range*; *detecting amplitudes and phases of the pilot tone* along a forward path and a reflected path of the optical transmission path; [and] *determining dispersion* in at least a portion of the optical transmission path *based on the detected amplitudes and phases...*" (emphasis added). Applicants note that the remaining independent Claims 17 and 37-39 also include the above highlighted elements. Applicants further note that dispersion determination through the use of detected amplitudes and phases along a forward and reflected path is in accordance with optical *frequency* domain reflectometry (OFDR).

Remarks Regarding the Cited References:

Wong illustrates a lightwave component measurement system that provides modulation measurements with the use of digital signal processing (abstract). In Fig. 2, Wong describes obtaining transmission and reflection characteristics of a device under test using a lightwave component analyzer 12 that is capable of generating a *swept signal* (Col. 5, lines 3-6). Wong also describes using single and multiple signal reflections of the *swept signal* to determine the location of one or more discontinuities in an optical fiber cable length (Col. 6, lines 24-28). The reflected *swept signal* is defined as an amplitude modulated signal, wherein the modulation results in ripple components (Col. 9, lines 14-24). Wong further explains on column 9, lines 51-57 (relied upon by the Office Action), that the periodicity and amplitudes of each ripple component (which is derived from the *swept signal*) contains distance and magnitude information with respect to discontinuities along the optical transmission medium.

In column 6, lines 4-7 (also relied upon by the Office Action), Wong also describes that the measurement system may be used for measuring *pulse* dispersion of lightwave system components, such as modulators, demodulators, optical fiber cables, and fiber optic components.

It should be noted that the measurement of *pulse* dispersion may typically involve the use of optical *time* domain reflectometry (OTDR).

Verhoof illustrates a method and apparatus for determining fault locations in a local optical network (abstract). Verhoof does not teach or suggest dispersion compensation.

Tomofuji illustrates a supervisor and control signal transmitting system for use in an optically amplifying repeater system, amplifying attenuated light, and transmitting data over a long distance between a transmitting station and a receiving station through a polarity of repeaters (abstract). Tomofuji does not teach or suggest dispersion compensation.

So illustrates an apparatus for measuring chromatic dispersion based on *pulse signals* (page 2110, under the subheading "Chromatic Dispersion," second paragraph). So teaches that chromatic dispersion may be measured by utilizing optical *time* domain reflectometry (OTDR) through traces of the *pulse signal* at three different wavelengths (page 2111, Col. 1, last paragraph).

Akiyama illustrates an apparatus for driving an optical modulator to measure, and compensate for, dispersion in an optical transmission line (abstract). In the device of Akiyama, a processor determines the amount of dispersion in a transmission line by comparing a time interval between first and second *detected pulses* to the *time interval* of the first and second *pulses before transmission* (abstract).

Lemus illustrates a method for detecting reflections in bidirectional multichannel communication systems by using a signature attached to each signal (abstract). Lemus does not teach or suggest dispersion compensation.

<u>The Claims Patentably Distinguish from the Combination of the Cited References</u>

The Office Action asserts that, based on the combination of the above described references, it would be obvious to one of skill in the art to determine dispersion based on detected amplitudes and phases. Applicants respectfully disagree.

All of the cited references which discuss dispersion determination (Wong, So, and Akiyama) teach dispersion determination methods involving *pulsed signals* and measuring *time intervals* of the received *pulsed signals*. Applicants respectfully assert that the cited references teach dispersion determination through the use of optical *time* domain reflectometry (OTDR). No where in any of the cited references is dispersion determination through the detection of

amplitudes and phases, as is in accordance with optical *frequency* domain reflectometry (OFDR), taught or suggested. While Wong does discuss measuring the periodicity and amplitude of a ripple component, this is discussed in the context of discontinuity location and *not* dispersion determination. In fact, Wong specifically teaches the use of measuring *pulse* dispersion in column 6, lines 4-10.

No combination of the cited references teach or suggest "*...sweeping the pilot tone across a frequency range*; detecting amplitudes and phases *of the pilot tone* along a forward path *and a reflected path* of the optical transmission path; [and] *determining dispersion* in at least a portion of the optical transmission path *based on the detected amplitudes and phases...*," as recited by Claim 1. The combination of the above cited references would result in a dispersion determination method based on optical *time* domain reflectometry (OTDR).

Therefore Claim 1 patentably distinguishes over the combination of the prior art of record. Claims 2, 3, 5-16, and 46 depend from Claim 1 and therefore patentably distinguish over the prior art of record for at least the same reasons.

Independent Claim 17 (from which Claims 18, 19, 21-36 and 47 depend) and Independent Claims 37, 38, and 39 (from which Claims 40 and 42-45 depend) also include the element of "*...determining dispersion* in at least a portion of the optical transmission path *based on the detected amplitudes and phases...*" As should be appreciated from the above remarks relating to Claim 1, the prior art of record does not teach or suggest the above mentioned element. Thus, Claims 17-19, 21-40, and 42-47 patentably distinguish over the prior art of record for at least the same reasons as mentioned in relation to Claim 1.

CONCLUSION

In view of the above amendments and remarks, it is believed that all now pending claims (Claims 1-3, 5-19, 21-40, and 42-47) are in condition for allowance, and it is respectfully requested that the application be passed to issue. If the Examiner feels that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned.

Respectfully submitted,

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Date: 6/19/08

Appl'n No.: 10/060,945
Title: Swept Frequency Reflectometry Using ...
Inventors: John C. Carrick and Ronald A. Haberkorn
Annotated Sheet

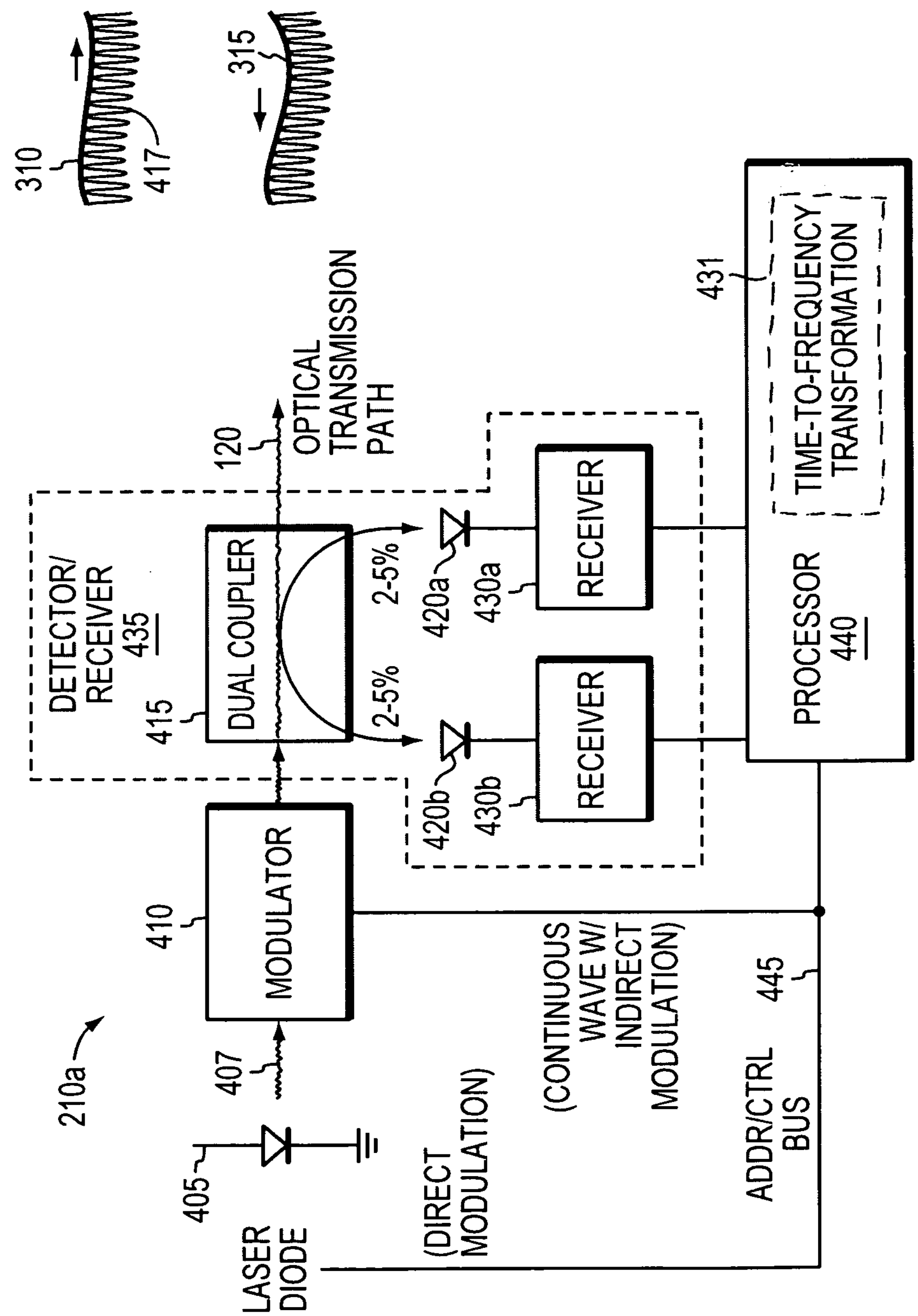

FIG. 4A